

PATENT  
TS1481 (US)  
CML:EL

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE  
BEFORE THE BOARD OF APPEALS AND INTERFERENCES

In re application of	)	
	)	
WOUTER DETLOF BERGGREN and	)	
FRANCISCUS JOHANNA ARNOLDUS MARTENS	)	Confirmation No.: 2312
	)	
Serial No. 10/552,551	)	Group Art Unit: 1795
	)	
Filed February 6, 2007	)	Examiner: Matthew J. Merkling
	)	
PROCESS TO PREPARE SYNTHESIS GAS	)	February 1, 2011
	)	

COMMISSIONER FOR PATENTS  
P. O. Box 1450  
Alexandria, VA 22313-1450

Sir:

**APPEAL BRIEF**

Applicants hereby submit this Appeal Brief in order to appeal the final rejection of claims 1, 2, and 4-6 in the office action mailed August 2, 2010.

Please charge any fees that are necessary in connection with the filing of this brief to Shell Oil Company, Deposit Account No. 19-1800.

### **Real Party in Interest**

The real party in interest is Shell Oil Company.

### **Related Appeals and Interferences**

To the best of the undersigned's knowledge, there are no related appeals or interferences.

### **Status of the Claims**

Claims 1, 2, and 4-6 are pending in the application and were finally rejected in the office action mailed March 29, 2010. Claims 1, 2, and 4-6 are on appeal.

### **Status of Amendments**

No amendments to the claims have been filed since the Final Rejection.

### **Summary of Claimed Subject Matter**

The invention as set forth in claim 1 is directed to a process for the preparation of a gas containing hydrogen and carbon monoxide from a carbonaceous feedstock. In the first step, the process comprises partially oxidizing a carbonaceous feedstock in a vertically oriented tubular partial oxidation reactor vessel having an upper end, and a lower end having an inlet, the vessel comprising a burner at the upper end thereby obtaining a first gaseous product of hydrogen and carbon monoxide having a temperature between 1100 °C and 1500 °C. See page 4, line 4 – page 5, line 4 of the specification. The process also comprises catalytically steam reforming a carbonaceous feedstock in the presence of steam in a convective steam reformer zone in a second vessel thereby obtaining a steam reformer product. See page 5, line 5 – page 6, line 20. The process further comprises reducing the temperature of the first gaseous product by between 300 °C and 750 °C by mixing the first gaseous product with the steam reformer product by feeding the steam reformer product into said inlet yielding a first mixture. See page 6, line 21 – page 7, line 6. The first mixture is contacted with a bed of reforming catalyst positioned in the lower end of the partial oxidation reactor vessel just below said inlet to obtain a second mixture having a temperature between 950 °C and 1100 °C. See page 7, lines 7-28. Then, the second mixture is fed to the second vessel to provide heat for the convective steam reforming reaction zone by convective heat exchange between the second mixture having a temperature between 950 °C and 1100 °C and the

steam reformer reactor zone thereby obtaining a hydrogen and carbon monoxide containing gas having a reduced temperature. See page 7, line 29 – page 8, line 2.

### **Grounds of Rejection to be Reviewed on Appeal**

Claims 1, 2, and 4-6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Fuderer (US 4,650,651).

### **Argument**

*Rejection of claims 1, 2, and 4-6 were rejected under 35 U.S.C. 103(a) as being unpatentable over Fuderer*

Fuderer is directed to an integrated apparatus for the primary and secondary catalytic steam reforming of hydrocarbons. In the Fuderer apparatus, the primary and secondary reformer zones are contained within a single vessel. The partly reformed effluent from the primary reformer zone of the apparatus passes, in a suitable conduit, through the catalyst bed to the space at the feed end of the secondary reformer zone into which preheated oxygen-containing gas is being introduced. The hot secondary reformer effluent does not leave the apparatus, but passes on the shell side of the primary reformer zone, thereby applying the heat required for the endothermic primary reforming reaction that occurs within the catalyst-containing reactor tubes of said primary reformer zone.

The present invention, on the other hand, comprises two reaction vessels. Partial oxidation of the carbonaceous feedstock occurs in an upper end of the first reactor vessel and then, after mixing with the gaseous product of the steam reformer, passes through a bed of reforming catalyst positioned in the lower end of the partial oxidation reactor vessel. The gaseous mixture exiting from the partial oxidation reactor vessel after passing through the catalyst is fed to a second vessel to provide heat for the convective steam reforming reaction zone that is contained within the second vessel.

The arrangement of the present invention permits use of the catalytically steam reformed carbonatious feedstock to cool the partially oxidized carbonatious feedstock in the lower end of the first vessel before passing through the bed of reforming catalyst positioned in the lower end of the partial oxidation reactor vessel. Applicants respectfully submit that this arrangement is neither taught nor suggested by the Fuderer reference.

In Fuderer, the partly reformed effluent from the primary reformer passes to the secondary reforming zone through a conduit extending through the center of the secondary reforming catalyst bed to the reaction space above the catalyst bed. This configuration can cause uneven temperature gradients within the secondary reforming catalyst bed. The arrangement of the present invention avoids this disadvantage.

In view of the foregoing, Applicants submit that claim 1 would not have been obvious in view of the Fuderer reference. Inasmuch as the remaining claims all depend from claim 1, Applicants submit that they would not have been obvious for the same reasons.

### **Conclusion**

Based on the foregoing arguments, Applicant asserts that the claims of the present application would not have been obvious in view of the cited references. It is respectfully requested that this Appeal be upheld and that the application be sent back to the Examiner for allowance.

Respectfully submitted,

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## CLAIMS APPENDIX

1. A process for the preparation of a gas containing hydrogen and carbon monoxide from a carbonaceous feedstock, the process comprising:
  - (a) partially oxidizing a carbonaceous feedstock in a vertically oriented tubular partial oxidation reactor vessel having an upper end, and a lower end having an inlet, the vessel comprising a burner at the upper end thereby obtaining a first gaseous product of hydrogen and carbon monoxide having a temperature between 1100 °C and 1500 °C;
  - (b) catalytically steam reforming a carbonaceous feedstock in the presence of steam in a convective steam reformer zone in a second vessel thereby obtaining a steam reformer product;
  - (c) reducing the temperature of the first gaseous product by between 300 °C and 750 °C by mixing the first gaseous product with the steam reformer product by feeding the steam reformer product into said inlet yielding a first mixture;
  - (d) contacting the first mixture with a bed of reforming catalyst positioned in the lower end of the partial oxidation reactor vessel just below said inlet and obtaining a second mixture having a temperature between 950 °C and 1100 °C; and
  - (e) feeding the second mixture to the second vessel and providing heat for the convective steam reforming reaction zone in step (b) by convective heat exchange between the second mixture having a temperature between 950 °C and 1100 °C and the steam reformer reactor zone thereby obtaining a hydrogen and carbon monoxide containing gas having a reduced temperature.
2. The process of claim 1, wherein the steam to carbon molar ratio of the feed to step (b) is between 0.5 and 0.9.
3. Canceled.
4. The process of claim 1, wherein the content of methane in the steam reformer product is between 1 mol% and 10 mol% relative to the carbon present as hydrocarbon in the carbonaceous feed to step (b).

5. The process of claim 1, wherein the methane conversion in step (d) is between 10 wt% and 50 wt%.

6. The process of claim 1, wherein the temperature of the mixture obtained in step (d) is between 980 °C and 1050 °C.

## **EVIDENCE APPENDIX**

None

## **RELATED PROCEEDINGS APPENDIX**

None